Hand Hygiene: Knowing is Not Necessarily Doing

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Acknowledgements to:

Carol O'Boyle, RN, PhD, JCR

Roz Corcoran, RN, BJC

Centers for Disease Control and Prevention

World Health Organization

Joint Commission

Objectives

Describe the science supporting hand hygiene as a critical IPC activity

Discuss opportunities for hand hygiene in the healthcare setting

State behavioral barriers to high compliance with hand hygiene

Discuss best practices for monitoring hand hygiene and improving practice

1. Describe the science supporting hand hygiene as a critical IPC activity

Evolution of the Science of Hand Hygiene

Pioneers in Hand Hygiene

Ignaz Semmelweis

- Maternity Wards – Vienna General Hospital

Oliver Wendell Holmes

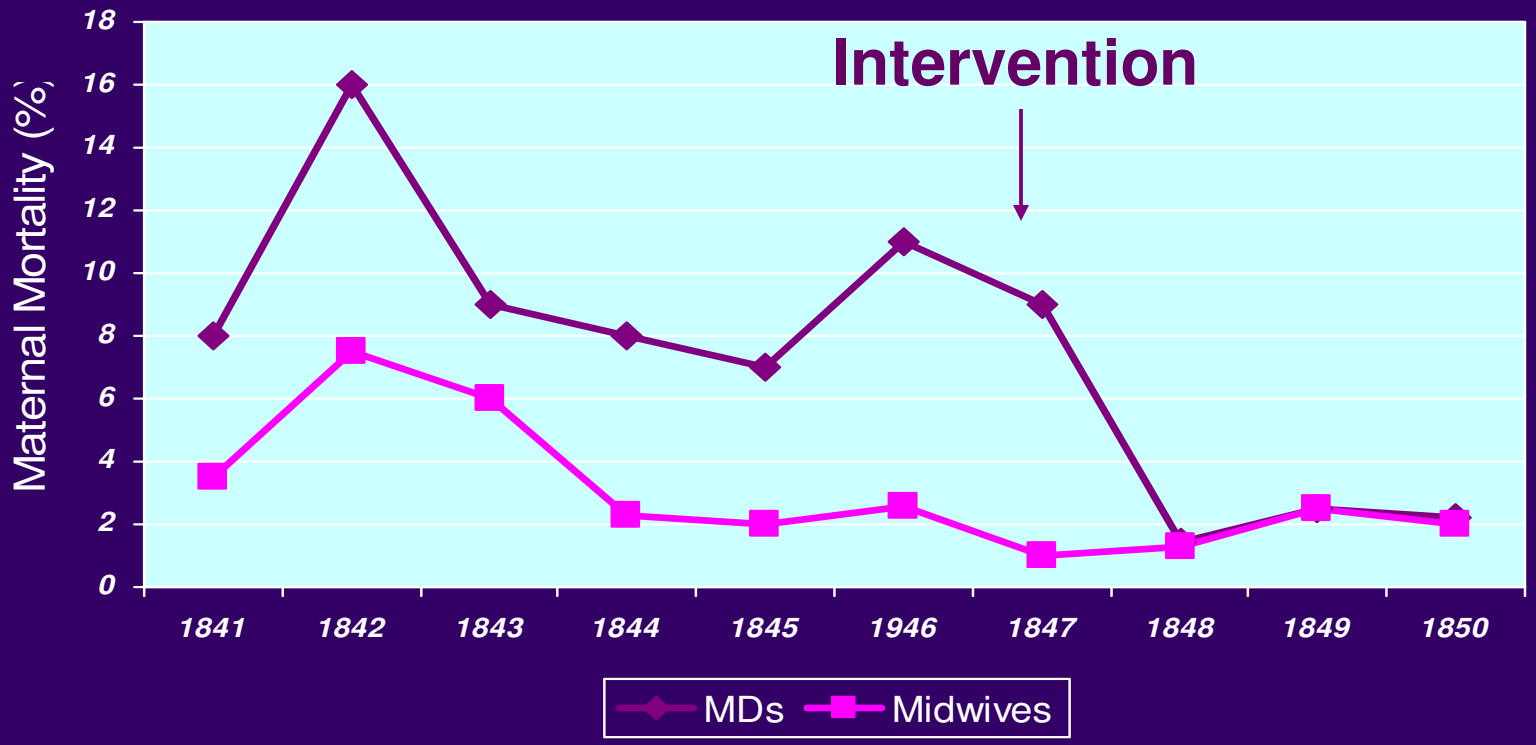
- Puerperal Sepsis

Florence Nightingale

- Cleanliness, Sanitation

Hand Hygiene: Not a New Concept

Maternal Mortality due to Postpartum Infection
General Hospital, Vienna, Austria, 1841-1850



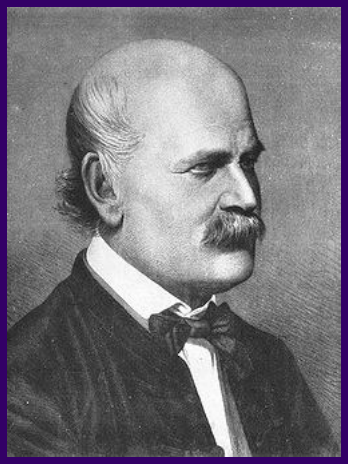
Adapted from: *Hosp Epidemiol Infect Control,* 2nd Edition, 1999.

The Intervention:
Hand scrub with chlorinated lime solution

May 1847
All medical students and physicians clean hands after autopsy and between patients

Hand hygiene basin at the Lying-In Women's Hospital in Vienna, 1847.

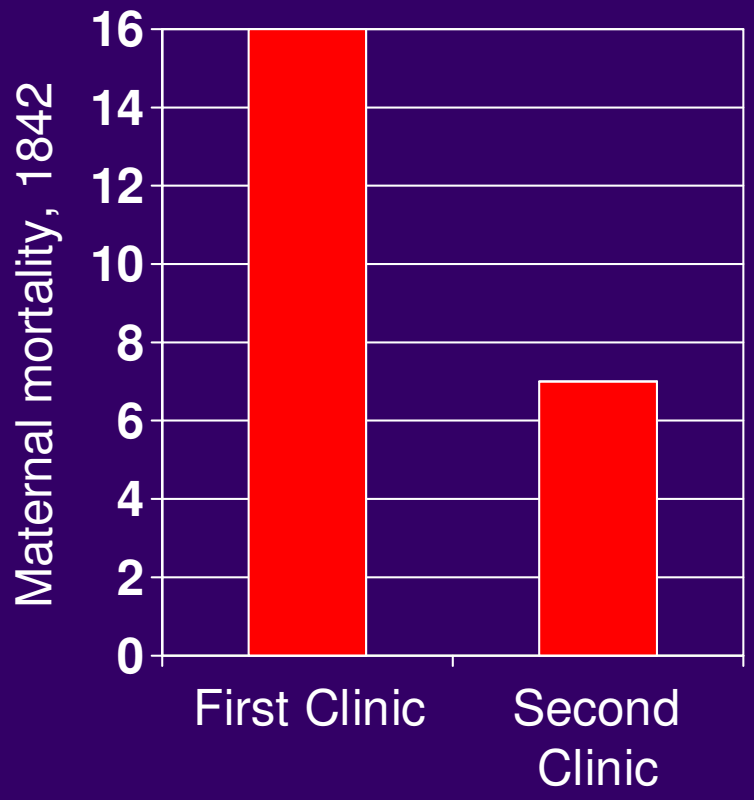
Ignaz Semmelweis, 1815-1865



1840's: General Hospital of Vienna

Divided into two clinics, alternating admissions every 24 hours:

- First Clinic: Doctors and medical students
- Second Clinic: Midwives



Why Did So Few Listen to Semmelweis?

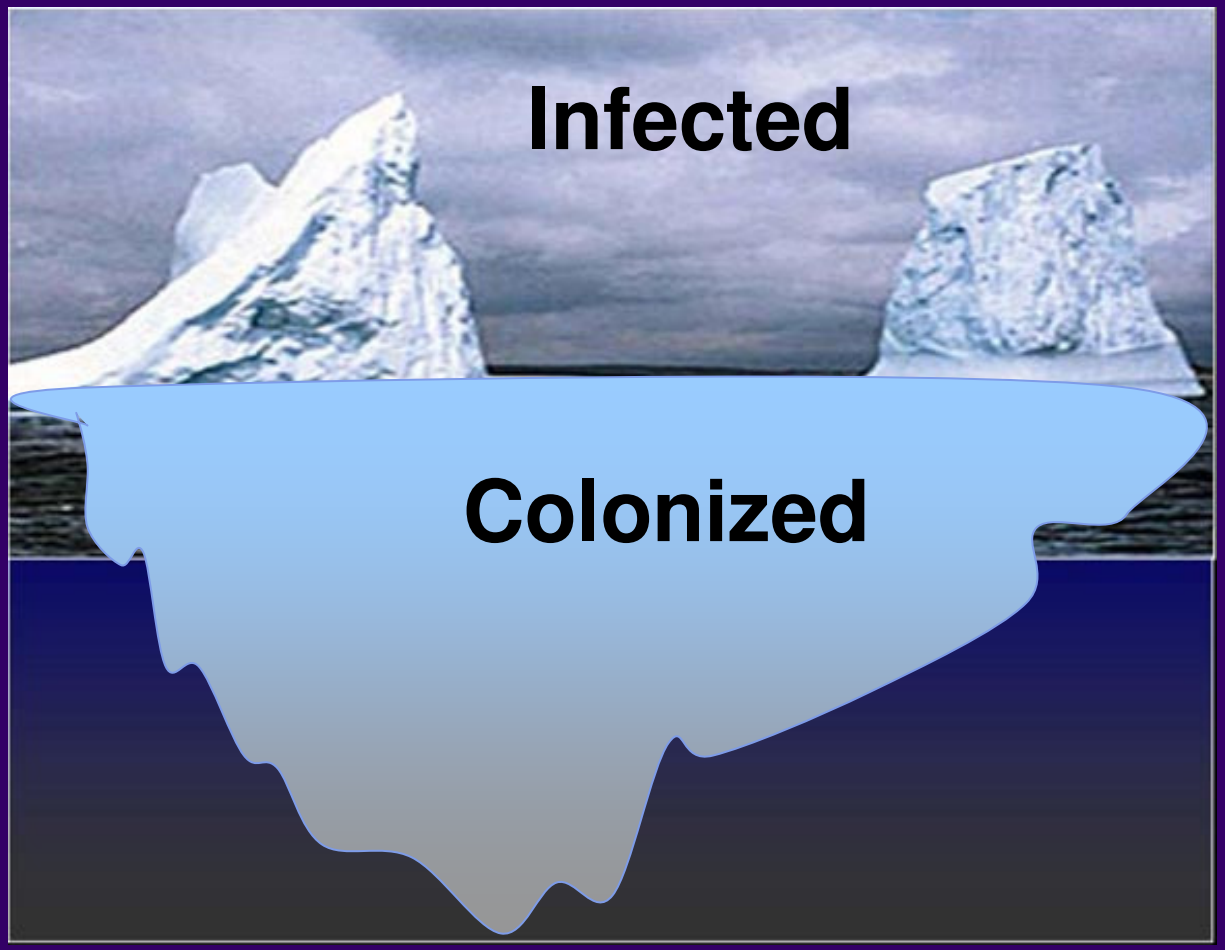
He failed to follow-up on his results

Published The Cause, Concept and Prophylaxis of Childbed Fever in 1861, 14 years after his discovery

Enormous opposition from the obstetrical community

Personal characteristics

The Iceberg Effect



Ecology of the Hand

Resident flora

- **live in the hair follicles and dead epithelium**
  - coagulase-negative Staphylococci and micrococci

Transient flora

- **cannot multiply on skin**
- **easily removed by mechanical means**

Pseudomonas and other gram negative rods

Somewhere in between…

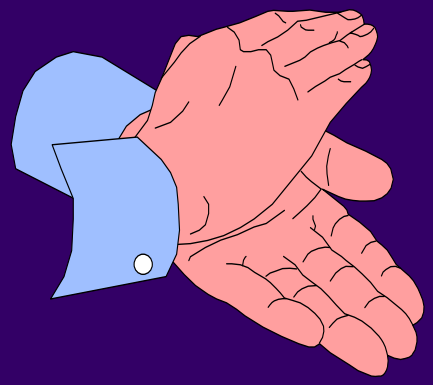
- ***S. aureus* and beta-hemolytic streptococci**

From healthy skin . . .

10^6 particles shed daily (10x10x10x10x10x10)

- Normal skin, patient gowns, bed linens, bedside furniture, patient environment
- Staphylococci or enterococci

10% contain viable bacteria



What is the Evidence of Relationship Between Hand Hygiene and Healthcare-Associated Infections ?

Substantial evidence that hand hygiene reduces the incidence of infections

Historical study: Semmelweis

More recent studies: infection rates lower when antiseptic handwashing was performed

Guideline for Hand Hygiene in Health-care Settings . *MMWR 2002*; vol. 51, no. RR-16.

Modern Researchers in Hand Hygiene

Dr. Elaine Larson

Dr. Didier Pittet

Challenges to Linking Hand Hygiene Practices and Health Care–Associated Infection Rates

- Large sample sizes are needed
-Limitations in the study designs
-Outcomes such as infection rates are affected by numerous additional factors
-Often hand hygiene is included in intervention “bundles” that address several aspects of care processes
-The limitations of accurately measuring hand hygiene adherence using observation or product measurement
-Measurement methods have inherent biases
-Some infection rates are more likely than others to be sensitive to changes in hand hygiene.
-Some infections may be due to endogenous flora (normal and abnormal flora that are carried by the patient upon admission

HH Studies with positive results

Pittet D., et al.: Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet 356:1307–1312, Oct. 14, 2000. Errata in: Lancet 356:2196, Dec. 13–20, 2000.	Implemented a multimodal HH campaign with promotion of bedside antiseptic hand rubs. Measures included seven observation periods with > 20,000 opportunities across four years and hand rub consumption.	Significant improvement in observed HH adherence and consumption of ABHR, which coincided with overall HAI rate decreases from 16.9% to 9.9% and MRSA transmission rates falling from 2.16 episodes per 10,000 to 0.93 episodes.
Larson E.L., et al.: An organizational climate intervention associated with increased hand washing and decreased nosocomial infections. Behav Med 26:14–22, Spring 2000.	Eight-month trial to assess the impact of an intervention to change organizational culture on frequency of hand hygiene and HAIs, methicillin-resistant Staphylococcus aureus (MRSA), and vancomycin-resistant enterococci (VRE).	85% relative reduction of VRE rate in the intervention hospital and 44% in control hospital. Rates of MRSA were not significantly different between hospitals.

HH Studies with negative results

Rupp M.E., et al.: Prospective, controlled, cross-over trial of alcohol-based hand gel in critical care units. Infect Control Hosp Epidemiol 29:8–15, Jan. 2008.	Two-year prospective controlled crossover trial of alcohol-based hand rub (ABHR) gel	Significant improvement in hand hygiene (HH) adherence was not associated with detectable changes in health care–associated infection (HAI) incidence
Eckmanns T., et al.: Hand rub consumption and hand hygiene compliance are not indicators of pathogen transmission in intensive care units. J Hosp Infect 63:406–411, Aug. 2006.	Primary outcome was incidence of transmission of 10 most frequent pathogens using "gold standard" genotyping methods; observed HH adherence, and measured product consumption; 18 months.	Researchers found an increase in HH adherence over time, but there was no correlation between transmission rates of health care–associated pathogens, hand rub consumption, or observed HH adherence.

WHO Guidelines on Hand Hygiene in Health Care

First Global Patient Safety Challenge
Clean Care is Safer Care

http://www.who.int/gpsc/en/index.html
www.who.int/gpsc/country_work/application_form/en/index.html.

Tools, webinars, videos, success stories

What do we know about transmission of organisms to and from HCW hands ?

Bacterial Contamination of Hands During Patient Care

Methods

- HCW washed hands and then had patient contact – 417 episodes – trained observers
- Cultured 5 finger tips – dominant hand after episode of patient care prior to post-care handwashing
- Multiple regression analysis to determine independent variables associated with increased contamination of hands

*Pittet, Arch Intern Med 1999; 159(8):821-6

Hand Hygiene Results

The longer the activity, the greater the bacterial counts (linear increase)

- **Average 16 CFU per minute of activity**

Direct patient care, respiratory care and handling body secretions had higher counts

HCW's who washed with soap and water prior to the episode of care had higher counts than HCW's who use alcohol based hand hygiene products

Pittet et al.

2. Discuss indications and opportunities for hand hygiene in the healthcare setting

Hand Hygiene *Indications*

The reason why HH is necessary at a given moment

Justified by risk of pathogen transmission from one surface to another

Temporal reference: before and after

- Before patient contact
- After contact with BBF
- After removing gloves
- Before invasive procedures

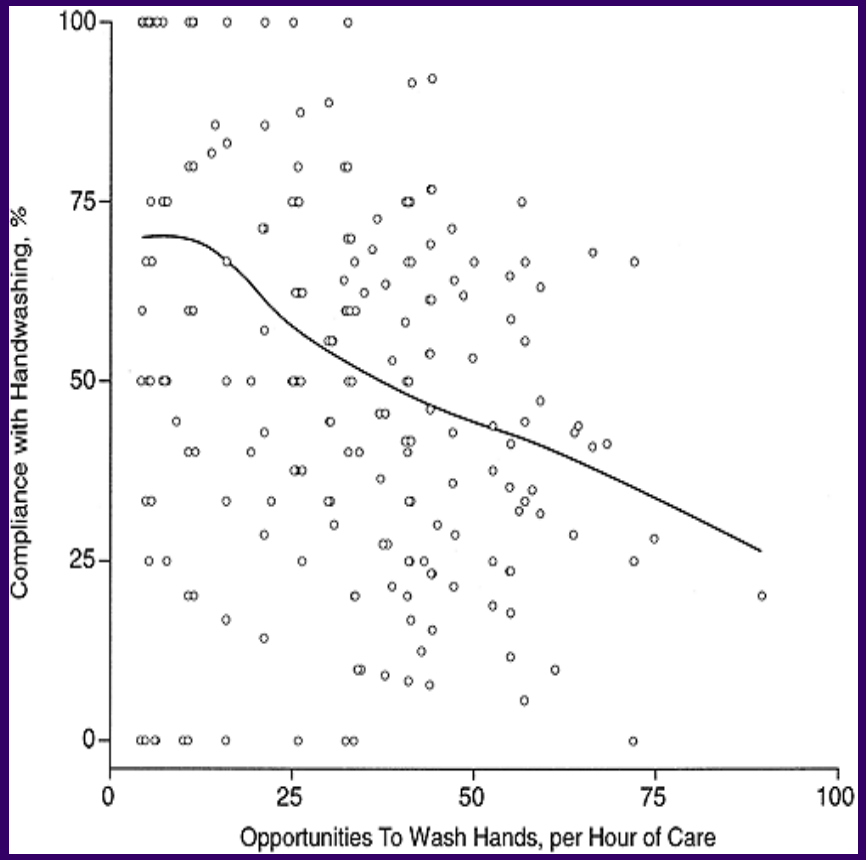
WHO HH Guidelines, 2009

Hand Hygiene *Opportunity*

The period between the time when hands become colonized after touching a surface (either environment or patient) and the moment in which those hands touch another patient or surface.

- After care patient A before patient B
- Before invasive procedure
- After touching bedside table before suctioning
- After care of urinary catheter before oral care
- After touching nose/mouth before manipulating IV line

Handwashing Opportunities in Teaching Hospitals per Hour

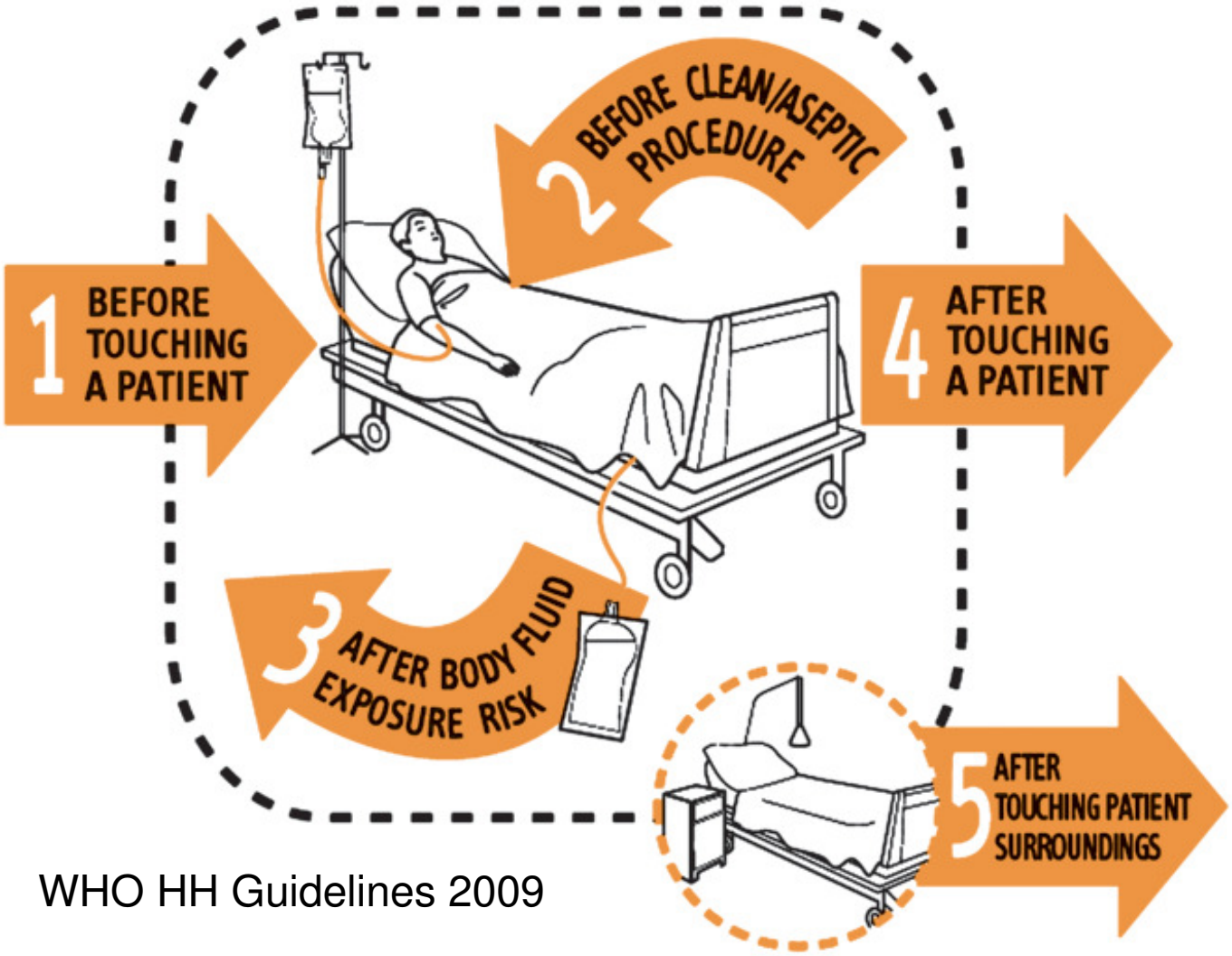


- Ward 20-40 opp / hr care
- ICU 43 opp / hr care
- Decrease of compliance by 5% per 10 opportunites per hour

Correlation between high workload and low compliance

Pittet D. Ann Intern Med 1999

My 5 moments for HAND HYGIENE



WHO HH Guidelines 2009

What is the
INDICATION
for hand hygiene?

What is the
OPPORTUNITY
for hand hygiene?

Hand and Glove Contamination

- In one study, hands of 131 healthcare workers (HCWs) were cultured before, and hands and gloves after, routine care.
- Before: A mean of 56% of body sites and 17% of environmental sites were VRE positive.
- After: touching the patient and environment, 75% of ungloved HCWs hands and 9% of gloved HCWs hands were contaminated with VRE.
- After touching only the environment, 21% of ungloved and 0 gloved HCWs hands were contaminated.
-

The inanimate environment plays a role in facilitating transmission of organisms.

The Risk of Hand
and Glove Contamination
after Contact with a VRE (+)
Patient Environment.
Hayden M, ICAAC, 2001, Chicago, IL.

The Inanimate Environment Can Facilitate Transmission

~ Contaminated surfaces increase cross-transmission ~

X **represents VRE culture positive sites**

- **After touching objects in patient's environment**

Abstract:
The Risk of Hand
and Glove Contamination
after Contact with a VRE (+)
Patient Environment.
Hayden M, ICAAC, 2001, Chicago, IL.

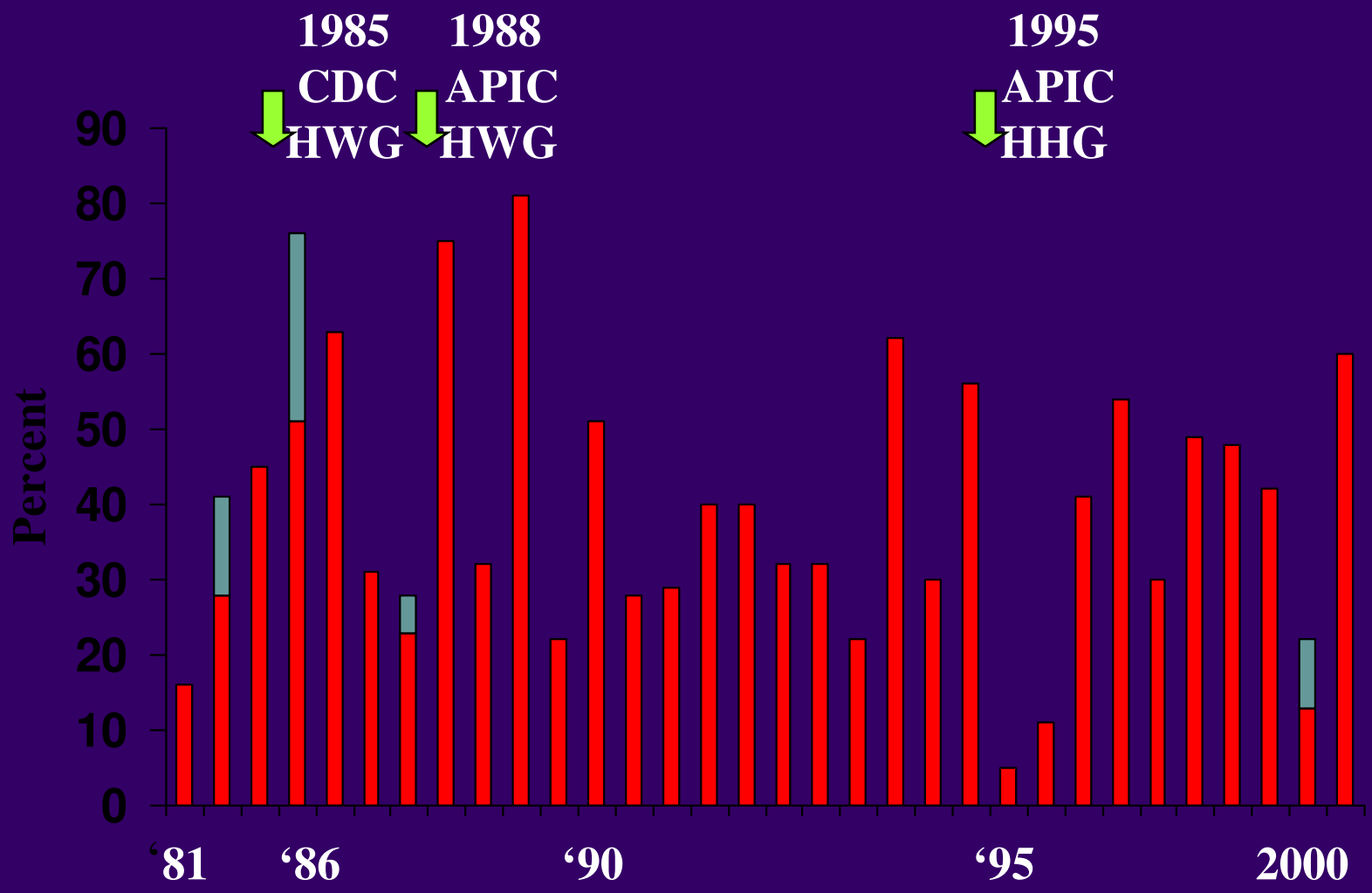
Opportunities for Measuring Hand Hygiene

Opportunities provide the desired denominator to be used for the calculate compliance with optimal hand hygiene.

95 hand hygiene completions / 110 hand hygiene opportunities = 86%

3. State behavioral barriers and motivators to high compliance with hand hygiene

Handwashing Adherence Rates
Among Healthcare Worker in 32 Published Studies
(created by John M. Boyce, M.D.)



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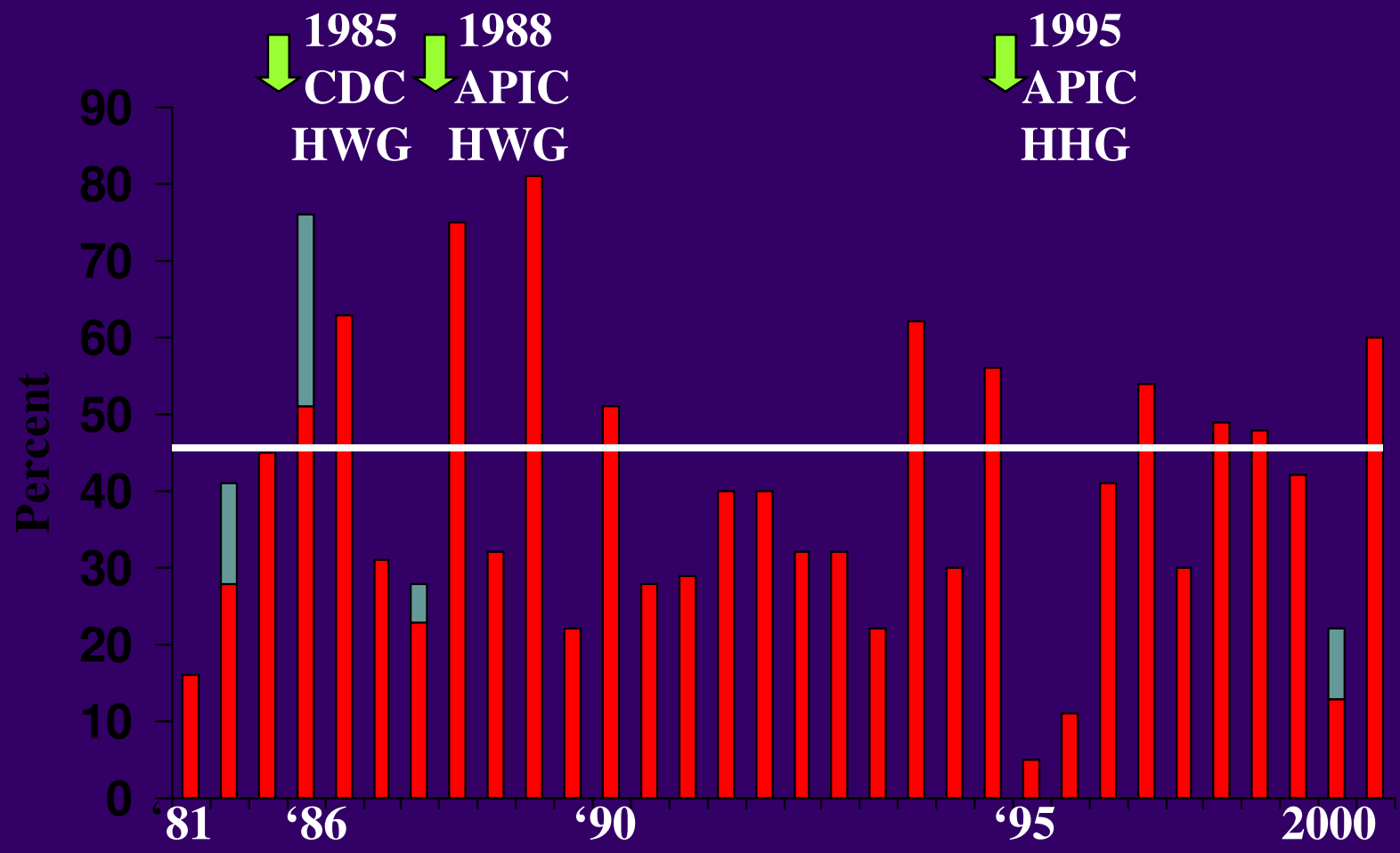


Hand Hygiene Adherence in Hospitals

Year of Study	Adherence Rate	Hospital Area
1994 (1)	29%	General and ICU
1995 (2)	41%	General
1996 (3)	41%	ICU
1998 (4)	30%	General
2000 (5)	48%	General

1. Gould D, *J Hosp Infect* 1994;28:15-30. 2. Larson E, *J Hosp Infect* 1995;30:88-106. 3. Slaughter S, *Ann Intern Med* 1996;3:360-365. 4. Watanakunakorn C, *Infect Control Hosp Epidemiol* 1998;19:858-860. 5. Pittet D, *Lancet* 2000:356;1307-1312.

Handwashing Compliance by Profession

Profession	Compliance
Registered Nurses	26%
Physicians	21%
Nurses Aides	14%
Respiratory Therapists	10%
Radiology Technicians	0%
Environmental Staff Services	0%
Medical Students	83%

Kim P. Am J Infect Control April 2003

What Motivates Nurses to Adhere to Hand hygiene Recommendations?

Factors important in HH of ICU Nurses: Study by O'Boyle

What are beliefs about outcomes of handwashing?

Whose opinions are important?

In which patient care situations are nurses less likely to wash hands?

120 Critical Care Nurses

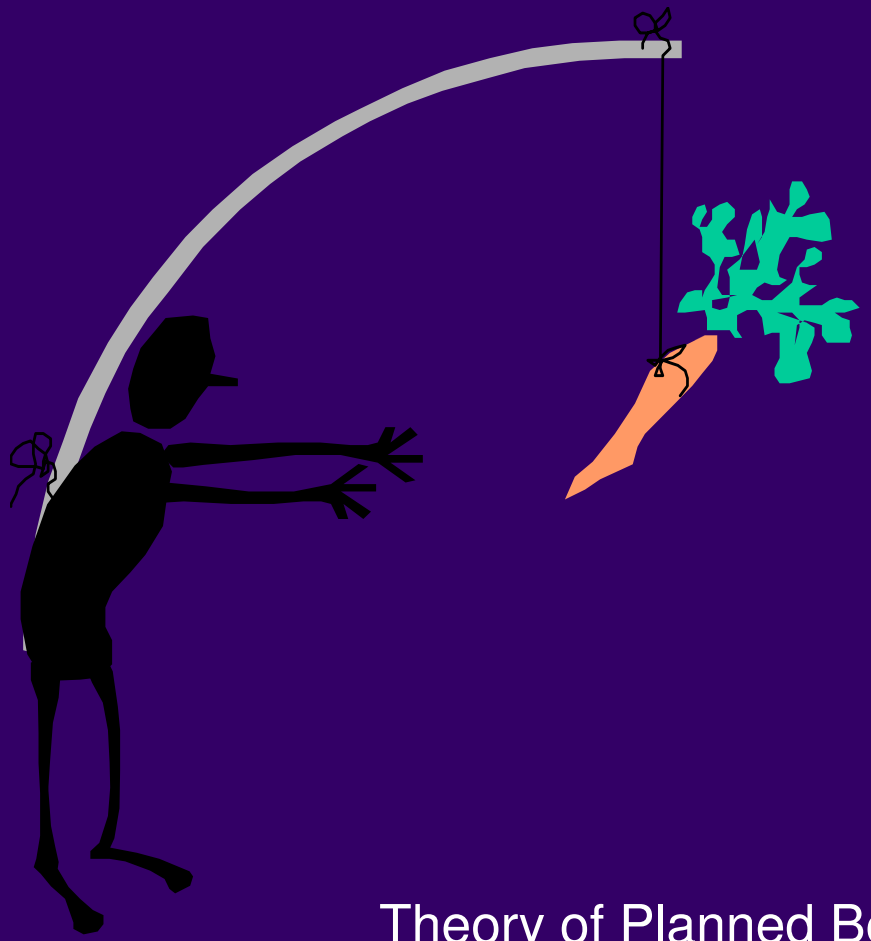
O'Boyle CA, Henly SJ, Duckett LJ. Nurses' Motivation to Wash Their Hands:
A Standardized Measurement Approach.
Applied Nursing Research 14;3:136-45, 2001

Factors influencing HCW hand hygiene practices

Internal

External

Internal Motivational Factors



Attitude

Social norm

Perceived control

Intention

Theory of Planned Behavior

Attitude

Feelings associated with a behavior

Beliefs about outcomes of a behavior

Beliefs about outcomes

↑ Protect self

↑ Reduce patient infections

Attitude – Handwashing

↑ Necessary

Ø Performance review

Social Norm

Perception of what is important and what "significant others" believe the person should or should not do and the person's desire to comply with the wishes of the "other" (referent)

Social Norm: Important "Others"

Nurse Manager

Co-workers

Physicians

Spouse or significant other

Friends

Patients

Patients' families

Perceived Control

How easy or difficult it will be to perform the behavior.

How much control does one have over the situation in which we are to perform the behavior.

Perceived Control determined by beliefs about resources available to perform the behavior:

Knowledge of when, why and how to perform behavior

Skills to perform the behavior

Resources (equipment/supplies) available

Ajzen, 1998

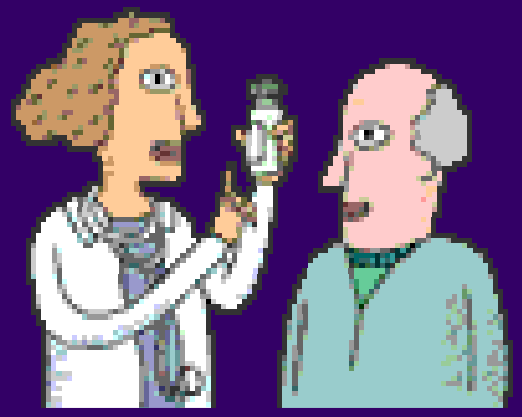
Intention and HH behaviors - Correlation

In decreasing order:

- **↑ Patient infected**
- **↓ Sore hands**
- **↓ Patient crisis**

External factors

Activity level in work setting
Physical environment



Nursing Unit Activity

- **Nurse/patient**
- **Unit census**
- **Shift**
- **Type of unit**
- **10 HW indications (< 1 hour)**
- Time “busy”

Physical environment

Inconvenient location of sinks and HH resources or supplies

How do nurses actually wash hands or perform hand hygiene?

O'Boyle C. Understanding adherence to hand hyg
Recommendations: the theory of planned behavio
AJIC, 2001

Self-Report of HH Performance

↑ Direct contact with body substances

↓ Care interrupted

Handwashing Observations

Direct contact/after care	**= 87%**
Before care	**= 62%**
Before touching own mouth, nose, eyes, face	**= 3%**

Handwashing Behavior

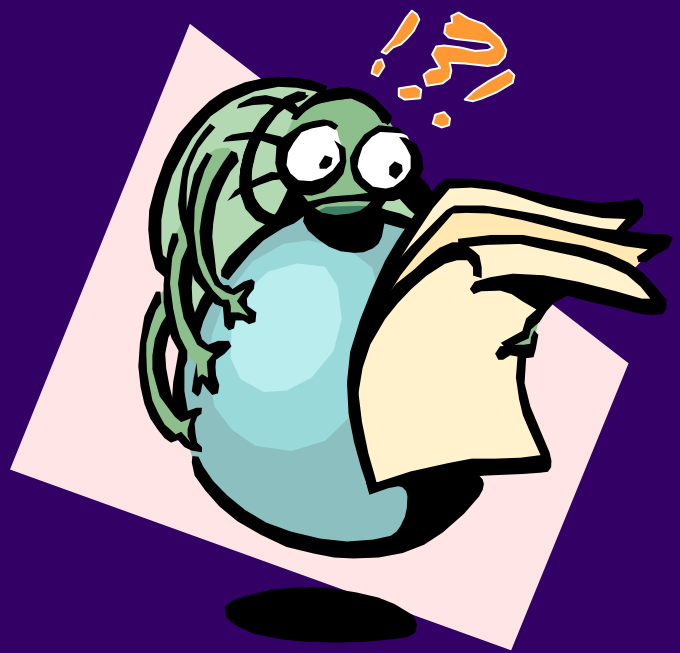
N=1246

Observed	Self-reported	Difference
70%	82%	9% to 15%*

*p < 000

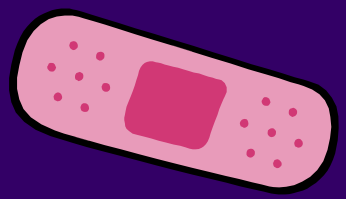
O'Boyle C. Understanding adherence to hand hygiene Recommendations: the theory of planned behavior AJIC, 2001

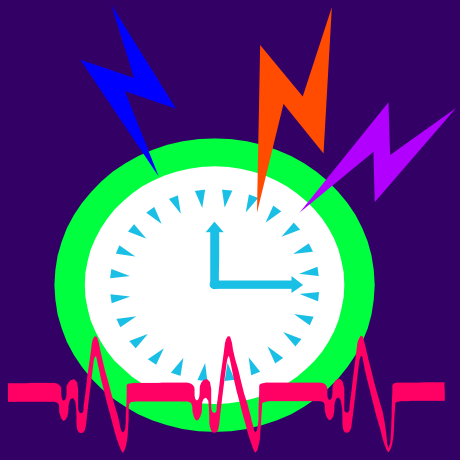
If handwashing is one of the simplest ways to control the spread of microorganisms why don't we follow handwashing recommendations?



Factors influencing adherence

- **Work load**
- **Time “busy”**
- **Inconvenient location of sinks**
- **Sore, chapped, cracked hand skin**
- **Motivation? Knowledge?**
- **Type of body substance**

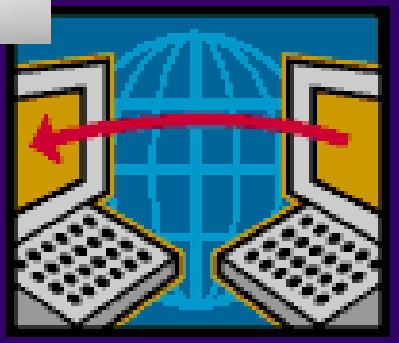


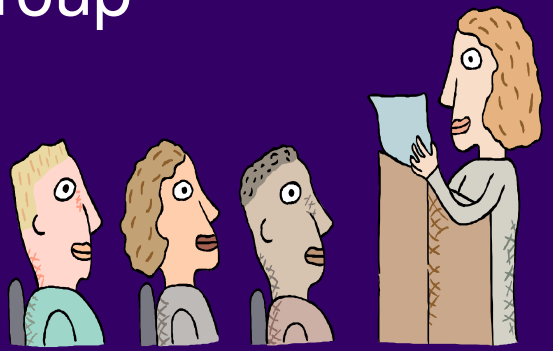


Addressing Hand Hygiene

Multipronged approach most effective

- Education
- Engineering
- Visual
- Champions
- Competition
- Social Support Group
- Data
- Leadership





Multi-modal approach to HH

System change: alcohol-based handrub 1B.

System change: access to safe continuous water supply and towels

Training and education

Observation and feedback

Reminders in the workplace

Institutional safety climate

WHO Guidelines for HH
May, 2009

Methods for Changing and Improving Hand Hygiene Behaviors

Cognitive	Lack of knowledge of the results of poor hygiene and the evidence base	Education; solutions identified through discussion of barriers
Behavioral	Behavior is mainly influenced by external stimuli; more are needed to change behavior	Reminders, feedback, incentives, modeling, and external reinforcement
Social Influence	Absence of social norms promoting hand hygiene; lack of leadership	Local consensus, opinion leaders, role models setting examples
Marketing	Important to have clear and attractive message tailored to target audience	Mass media campaigns, academic detailing
Organizational	Problem is system failure not individual practitioner	Quality improvement teams, redesign processes, workload, promoting safety oriented culture

Joint Commission HH Monograph: www.jointcommission.org

4. Discuss best practices for monitoring hand hygiene and improving practice

Measuring Hand Hygiene Compliance

Direct Methods

Self Reporting

Indirect Methods

Direct Observation

"Gold Standard"

- Reliable if performed well
- Can pin point problem areas, staff, times and improvement opportunities
- Able to detect all opportunities for hand hygiene
- Must define "opportunity for hand hygiene"

Direct Observation (con't)

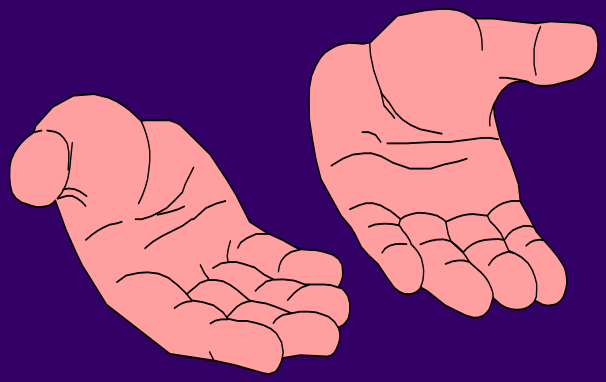
Can precisely designate areas for improvement and target efforts and resources

- Person (s)
- Time of Day
- Shift
- Unit

- Opportunities for hand hygiene action using alcohol-based handrubs can be distinguished from those requiring handwashing with soap and water

Direct Observation (con't)

- Can evaluate technique
  - Application
  - Time of process
  - Glove use
  - Jewelry, Nails
- Allows for a denominator, rate, and comparison over time
  - HH episodes/HH opportunities



Direct Observation - Challenges

Labor intensive

- Requires a presence
- Requires observer time – many hours

Trained and validated observers

Costly – many hours to obtain sufficient observations for analysis

Direct Observation – Challenges - Bias

- Observer
- Selection Bias
- Sample Size
- Timing
- What to Measure
- Variation in Staff Behaviors

Other Direct Observation Methods

Video Cameras

Badges with Computer Feeds

Self Reporting Hand Hygiene Practices

- Significant cost and time savings over direct observation method
- Complete a survey and self assessment
- Validity of reports in question

Self Reporting Hand Hygiene Practices

Moret et al.

- Observation of selected patient care activities in 25 care units for 8 specific procedures of patient care activities
- Followed by self assessment questionnaire
- Physicians and nursing attendants systematically **overestimated** HH and nurses consistently **underestimated** HH (recall bias)

Moret L. Tequi B, Lombrial P. Should self-assessment methods be used to measure compliance with handwashing recommendations? A study carried out in a French university hospital. Am J Infect Control 2004;32:384-390.

Self Reporting Hand Hygiene Practices

O'Boyle et al

- Self report versus observed with volunteer nurses
- Correlation between self – reported and observed HH behavior low
- Study allowed individual correlations between behavioral intention to perform HH, self reported compliance and direct observation.

O'Boyle CA, Henly SJ, Larson E. Understanding adherence to hand hygiene recommendations: the theory of planned behavior. Am J Infect Control 2001;29:352-360.

Indirect Measurement of Hand Hygiene

Monitoring Product Use or Electronic Monitoring of Sink Use

- Total use – not subject to selection or recall bias
- Less time consuming than direct observation
- Requires systems in place to measure product
  - Batching
  - By unit, by shift
- Can't "pinpoint" performance for improvement

Electronic alerts

Prospective interventional study in 30 bed hematology unit

>8000 HH opportunities measured

Phase I Baseline compliance 36.3%

Audible alerts from electronic devices

Phase II 70.1%

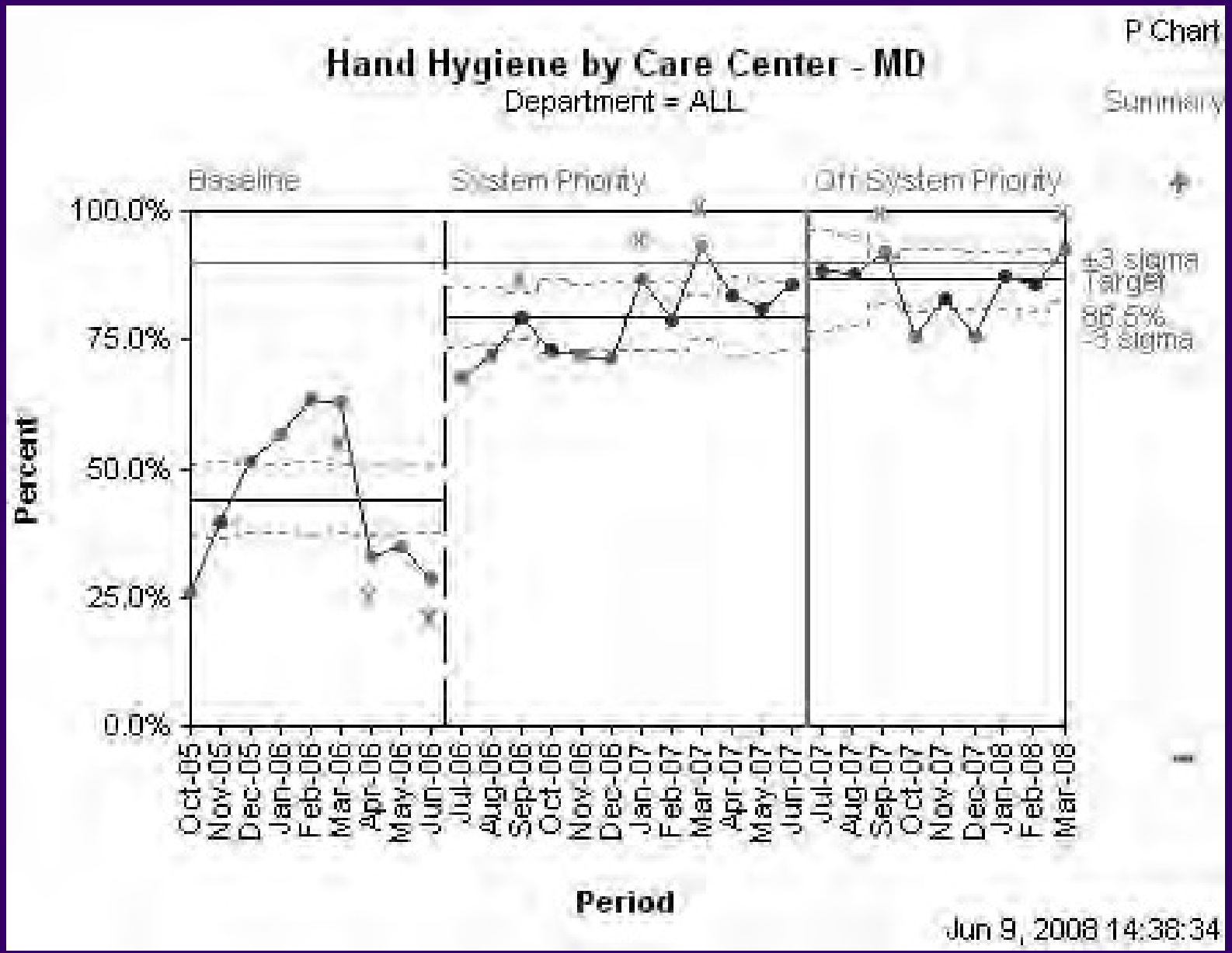
More study needed

Venkatesh AK, et al. AM J Infect Control 2008 Apr:36(3):199-205

Ideal HH Measurement Strategy

- Produces unbiased and exact numerical measure of how appropriately health-care workers (HCWs) practice hand hygiene
- Technology does not interfere with the behavior of those observed
- Assesses the microbiologic outcome of each hand cleansing action in real time
- Captures each moment requiring hand hygiene during complex care activity.
- Allows for continuous observation to exclude selection bias and underpowering.

Adapted from the WHO Hand Hygiene Guidelines 2009


P Chart
Hand Hygiene by Care Center - MD
Department = ALL
Summary
Baseline
System Priority
Off System Priority
100.0%
75.0%
50.0%
25.0%
0.0%
Percent
+3 sigma
Target
86.5%
-3 sigma
Oct-05
Nov-05
Dec-05
Jan-06
Feb-06
Mar-06
Apr-06
May-06
Jun-06
Jul-06
Aug-06
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
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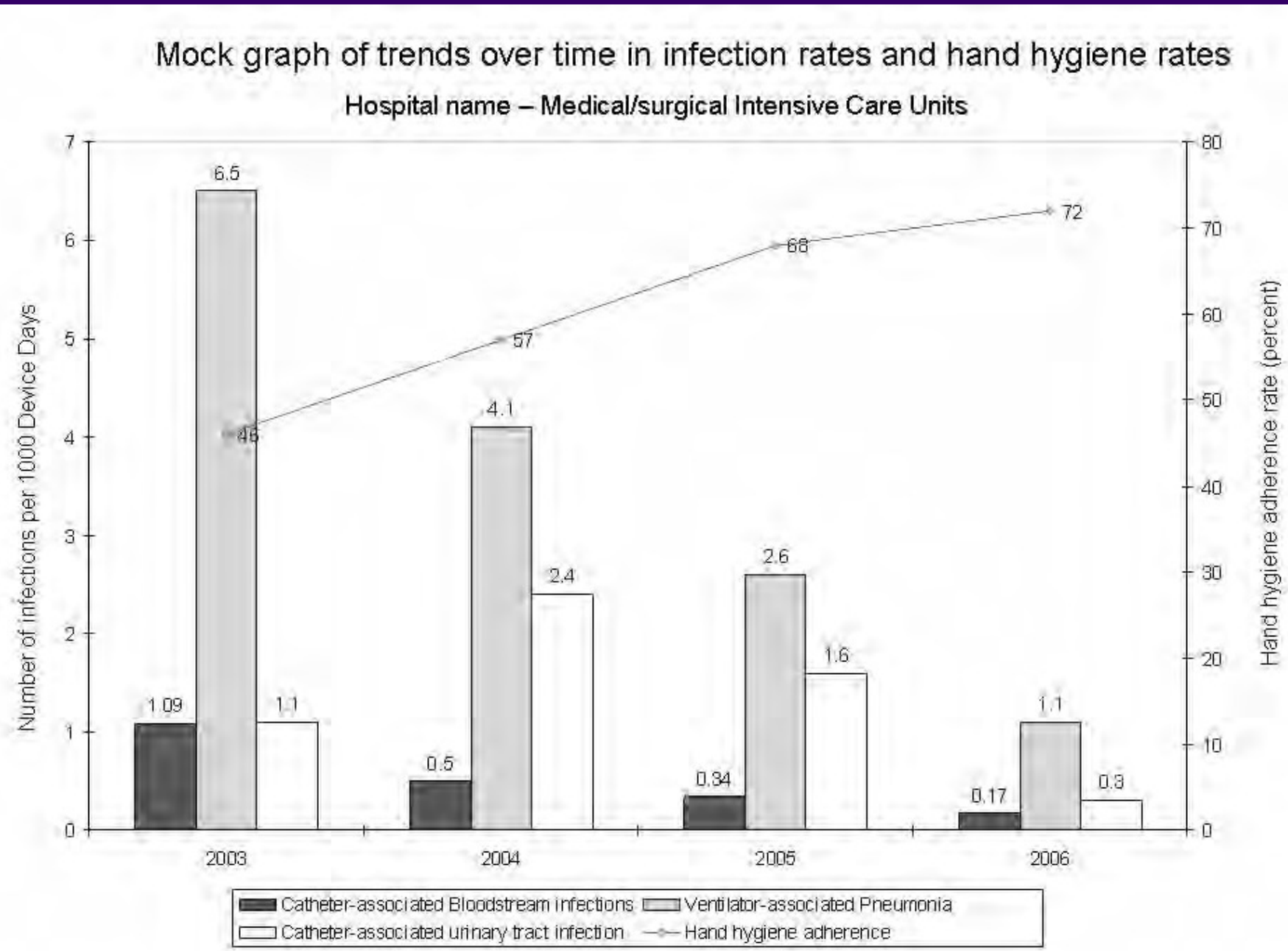
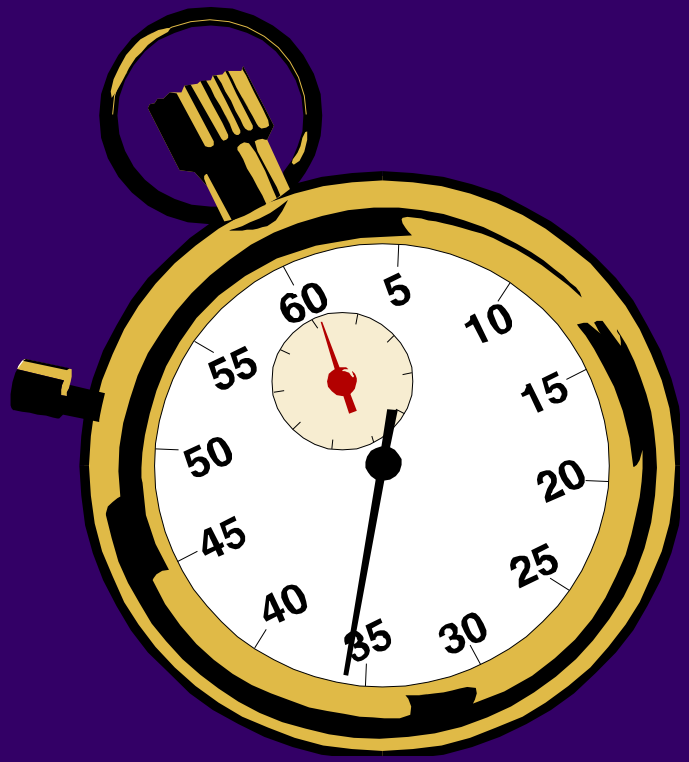
Period
Jun 9, 2008 14:38:34


Mock graph of trends over time in infection rates and hand hygiene rates
Hospital name – Medical/surgical Intensive Care Units
Number of infections per 1000 Device Days
Hand hygiene adherence rate (percent)
0
1
2
3
4
5
6
7
0
10
20
30
40
50
60
70
80
6.5
1.09
1.1
0.5
4.1
2.4
0.34
2.6
1.6
0.17
1.1
0.3
46
57
68
72
2003
2004
2005
2006
Catheter-associated Bloodstream infections
Ventilator-associated Pneumonia
Catheter-associated urinary tract infection
Hand hygiene adherence

Summary

- Science supports HH as a method to decrease HAIs but inconsistent results
- Hand hygiene is simple; compliance is complex
- There are multiple options for measuring HH adherence
- We are not where we need to be in healthcare for performing HH.

Time is Now !



Thank You !

Resources

Joint Commission HH Monograph : measuring Hand Hygiene Adherence: Overcoming the Challenges www.jointcommission.org

Boyce JM, Pittet D: Guideline for Hand Hygiene In healthcare Settings: Recommendations of the Healthcare Infection Control Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. www.cdc.gov/guidelines

WHO Guidelines on Hand Hygiene in Health Care. WHO, 2009 www.WHO.int

Resources

Health Canada: Infection Control Guidelines: hand Washing, Cleaning, Disinfection and Sterilization in Health Care. Ottawa, Canada: www.phac-aspc.gc.ca/publicat/ccdr-rmtc/98pdf/cdr24s8e.pdf, Dec 1998

Australian Government, Department of Health and Ageing: Infection Control Guidelines for the Prevention of Transmission of Infectious Diseases in the Health Care Setting. www.health.gov.au